# Urban mobility: new data and technology

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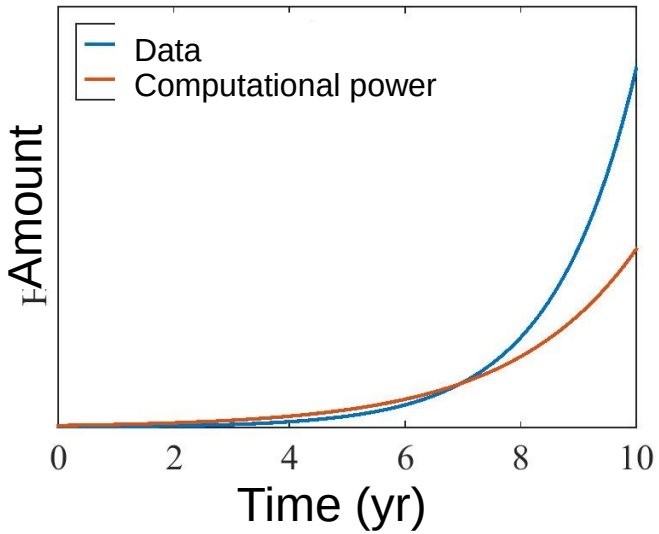
# City development

- More urbanization
  and (hence) more traffic jams
- Automatic driving
- More data and computing power to organise streams
- But that is no solution to everything



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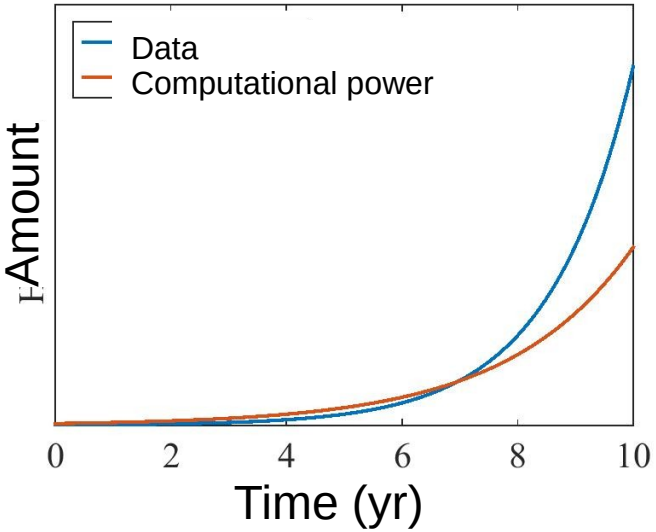
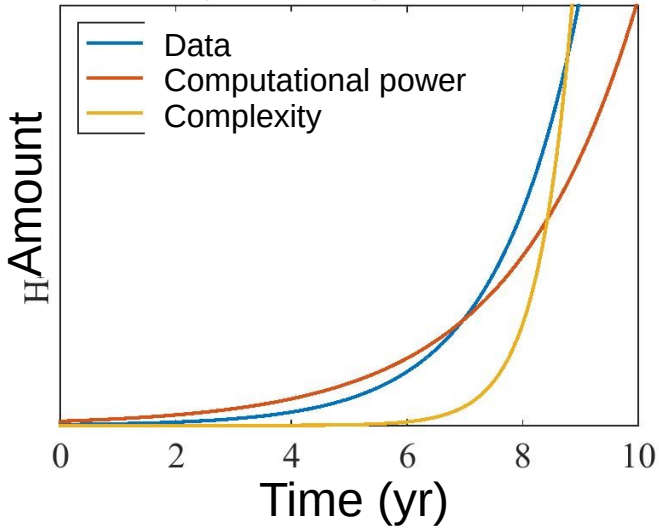


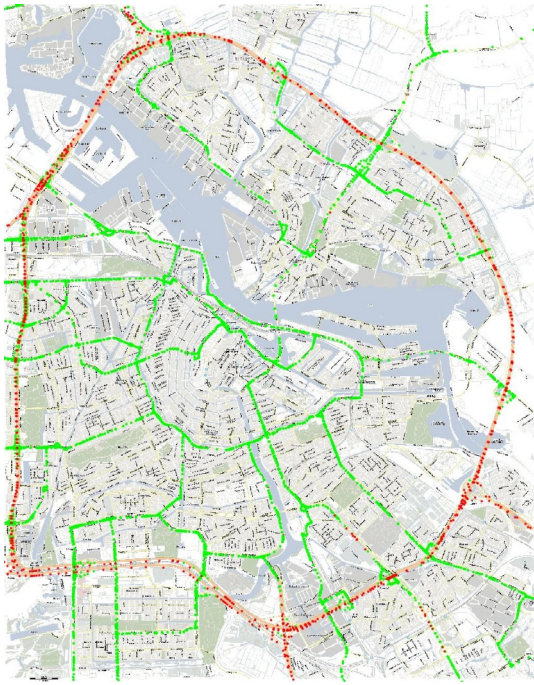



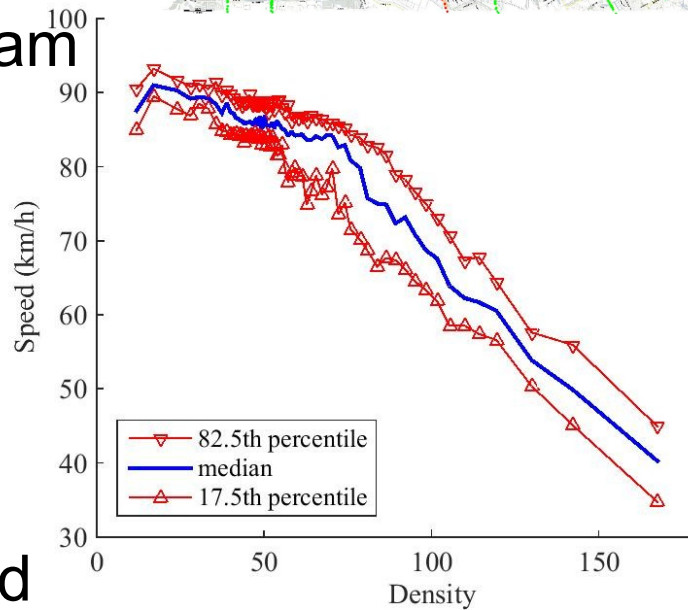
# Speed of traffic

- Drivers and cars optimize their own speed
- Locally: the more traffic, the lower the speed
- Impossible to use all data
- Try to combine data in a clever way

# Speed of traffic

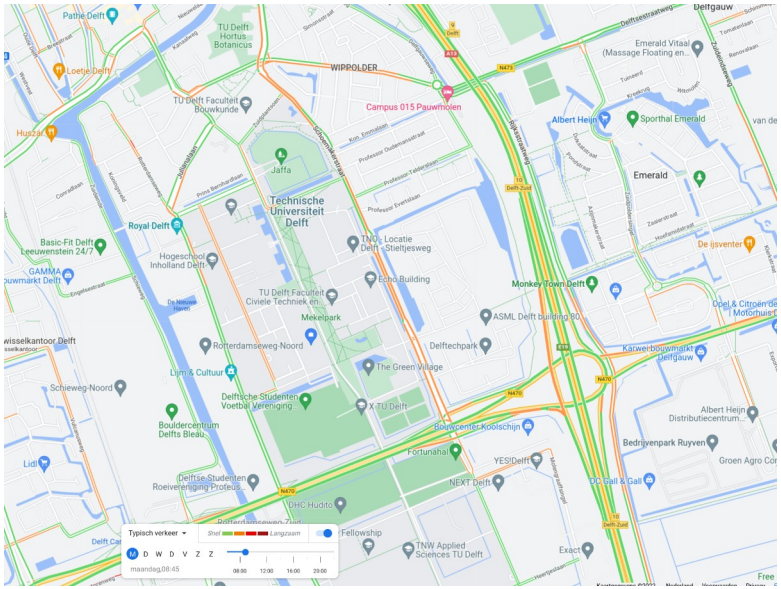
- Fast and accurate description of traffic in an **entire** city
- Test the relationship between average speed in a city and the amount of cars
- Collaboration with **Google (data)** and Amsterdam
- Facilitated by AMS
- Yield accurate predictive results
- Useful for routing, or allowing people onto the road





# Floating Car Data

- Vehicles broadcast where they are
- Combination of loops and **Floating Car Data (FCD)** works well
- FCD gives speeds on many points
- Loops indicate amount of vehicles
- Flows are essential to prediction and hence to control traffic



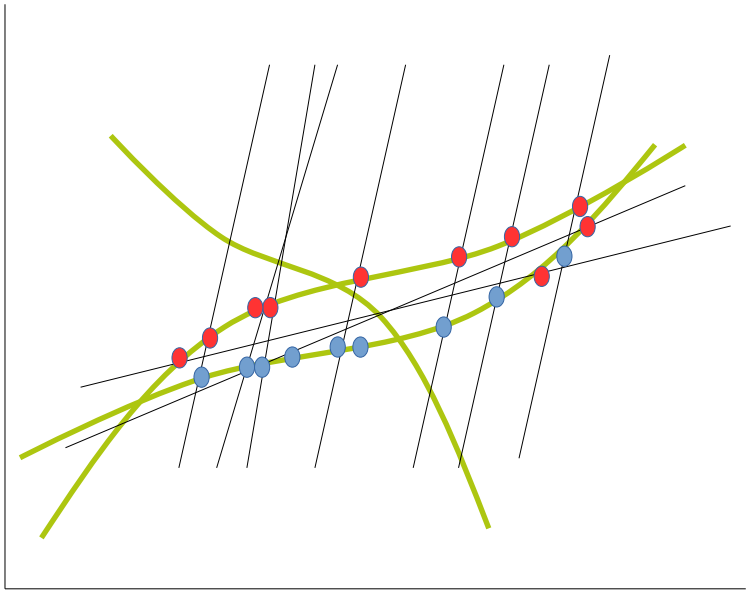
# Revloutionarize measuring traffic

- Measure position of some vehicles **and their overtaking**
- Combine this for different classes of vehicles (different speeds), and you know the number of vehicles between these vehicles, so density (and speed and intensity)
- With 1% of traffic already very good results in simulations
- Next steps: implement in practice

# Traffic measured with FCD

- If necessary, combine with loops so that there is always one fixed point
- High vehicles and other speed help
- Combine with traffic in the other direction

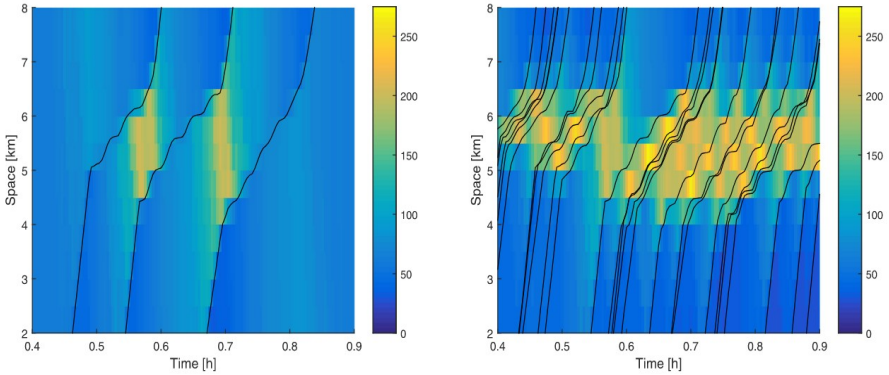
distance



Time

# Traffic measured with FCD

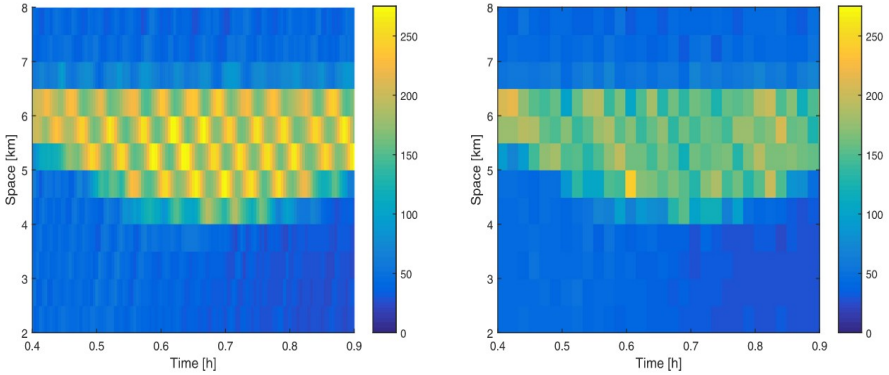
- Measure position of some vehicles **and their catching up movements**
-




(a) $p = 0.10\%$



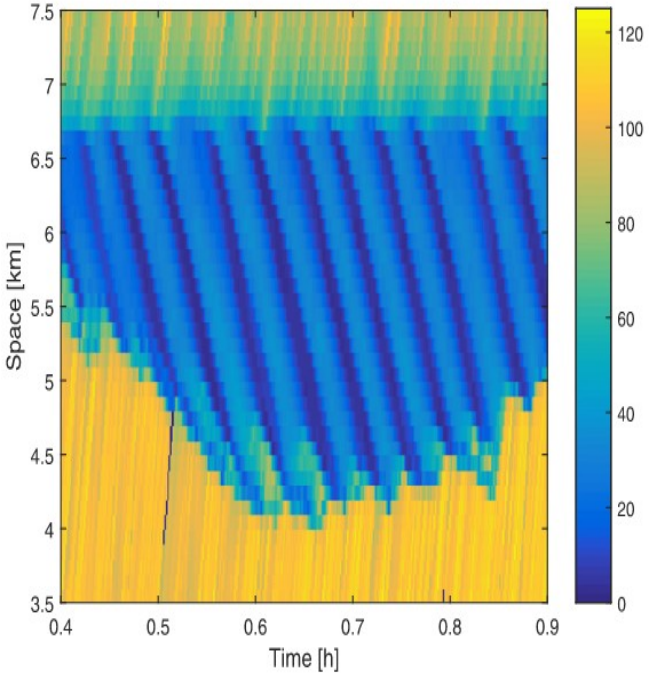

(b) $p = 1.0\%$




(c) $p = 10.0\%$




(d) Reference



# Next step: drones?

- Quick, automated deliveries
- No congestion
- Goods and people
- Many drones

# Controlling drone traffic

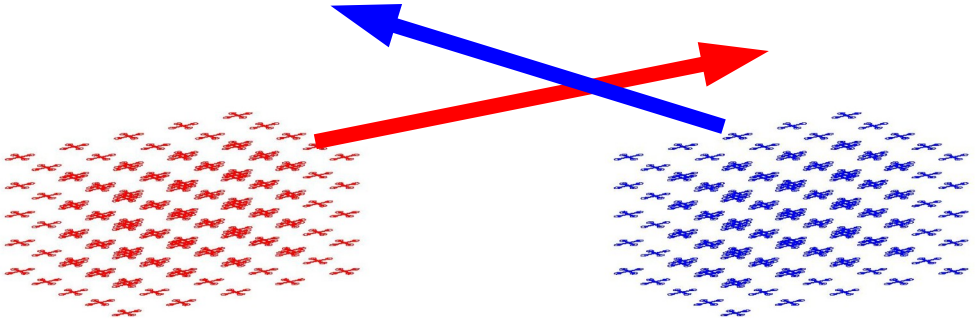
- Too many drones
  for centralized control
- Imagine that all car traffic
  would be centrally controlled…
- We'll need traffic rules & traffic regulations:
  - Road types
  - Priority
  - Traffic lights
- Stand-alone solutions, so:
  - No centralized computing unit addressing all drones

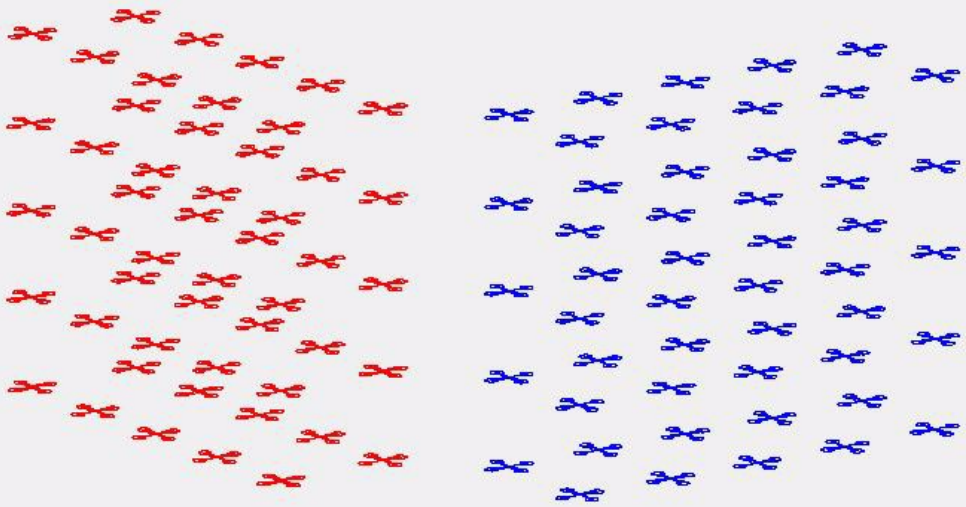
## Drone path predictions

- Stand-alone solutions, so:
  - No centralized computing unit
  - No collaborations
- Pass in a clever way
- Using positions of other drones
  (assumed perfect sensing – could be by information exchange)
- Based on pedestrian models,
  but adapted for relative speeds

# Setup

- Two clouds of drones crossing





Even further in the future?

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